invention. For example, it is possible that a film covering the cornea, or the cornea itself, may include concentrations of glucose which could be measured by ellipsometric techniques applying the principles of the invention. Furthermore, optically active ingredients other than glucose which effect polarization rotation of a beam in a sample may be measured using the basic techniques of the present invention. The sample may be other than a biological sample. The relative positions of quarter wave plate and the analyzer and the sample can be different than in the described embodiments. The light does not have to be perfectly monochromatic. Theoretically, the initial measurement could be made with the sample in the light path, with the analyzer rotated relative to the polarizer to extinguish the beam reaching the detector, the sample removed, and the DC signal shift needed to again extinguish the beam reaching the detector would represent the glucose concentration in the sample.

What is claimed is:

1. A method of measuring concentration of an optically active substance in the anterior chamber of an eye, comprising the steps of:

(a) guiding a polarized beam so it is generally parallel to an iris of the eye;

(b) introducing the beam into the anterior chamber such that it is refracted within the anterior chamber, impinges on the iris, is reflected therefrom, and then exits the anterior chamber approximately collinear with the beam immediately before the point at which it is introduced into the anterior chamber;

(c) guiding the beam exiting from the anterior chamber through an analyzer and onto a detector; and

(d) applying a signal to a polarization modulator to extinguish light passing from the analyzer to the detector, the signal representing the concentration of the optically active ingredient in the anterior chamber.

2. The method of claim 1 including the step of adjusting the orientation of a portion of the beam incident on a cornea of the eye until a stable, substantially increased output signal level is produced by the detector.

3. The method of claim 1 wherein the optically active substance includes glucose.

4. The method of claim 1 including calibrating the analyzer to extinguish light passing from the analyzer to the detector before performing step (a).

5. The method of claim 4 wherein step (d) includes simultaneously applying a DC signal and an AC signal to the polarization modulator to extinguish light of the beam to prevent it from passing from the analyzer to the detector by shifting the DC signal to a value that produces a null in the AC component of a corresponding output signal produced by the detector, the value of the shifted DC signal then representing the glucose concentration in the anterior chamber.

6. A method of measuring concentration of an optically active substance in the anterior chamber of an eye, comprising the steps of:

(a) guiding a beam through a polarizer oriented in a first direction to polarize the light in a first direction, and then through a polarization modulator and an analyzer oriented in the second direction to polarize the light in a second direction, and then guiding the beam from the analyzer to a detector;

(b) adjusting at least one of the polarizer and the analyzer to extinguish light of the beam to prevent it from passing from the analyzer to the detector;

(c) guiding the beam, after it passes through the polarizer, so it is generally parallel to an iris of the eye and then introducing the beam into the anterior chamber such that it is refracted within the anterior chamber and impinges on the iris, is reflected therefrom, and then exits the anterior chamber approximately collinear with the beam immediately before the point at which it is introduced into the anterior chamber;

(d) guiding the beam exiting from the anterior chamber onto the detector; and

(e) modifying a signal applied to the polarization modulator to extinguish light passing from the analyzer to the detector, the amount of modification of the signal representing the concentration of the optically active ingredient in the anterior chamber.

7. The method of claim 6 including the step of adjusting the orientation of a portion of the beam incident on a cornea of the eye until a stable, substantially increased output signal level is produced by the detector.

8. The method of claim 6 wherein the optically active substance includes glucose.

9. The method of claim 6 wherein step (e) includes simultaneously applying a DC signal and an AC signal to the polarization modulator to extinguish light of the beam to prevent it from passing from the analyzer to the detector by shifting the DC signal to a value that produces a null in the AC component of a corresponding output signal produced by the detector, the value of the shifted DC signal then representing the glucose concentration in the anterior chamber.

10. The method of claim 9 including applying the output signal to an input of a lock-in amplifier and determining that the null has been produced when a DC output of the lock-in amplifier is zero.

11. The method of claim 6 wherein step (a) includes passing the beam through a quarter wave plate after it exits from the polarizer.

12. The method of claim 6 including, before step (a), collimating light from a source to produce the beam.

13. The method of claim 6 wherein the beam is monochromatic.

14. The method of claim 6 wherein step (b) is performed before step (e).

15. The method of claim 9 wherein the polarization modulator includes a Faraday rotator and wherein step (e) includes applying the DC signal with the AC signal superimposed thereon to a coil of the Faraday rotator.

16. The method of claim 15 wherein the DC signal is a DC current having a value in the range of about 0.01 to 100 milliamperes.

17. The method of claim 16 wherein the AC signal is an AC current having a range in the value of about 0.01 to 10 amperes, to thereby reduce noise to the range of a few millivolts or less.

18. A system for measuring concentration of an optically active substance in an anterior chamber of the eye, comprising in combination:

(a) a light source producing a beam;

(b) a polarizer oriented in a first direction to polarize light of the beam in a first direction;

(c) a polarization modulator transmitting the beam after is has passed through the polarizer;

(d) an analyzer polarizing light from the polarization modulator in a second direction;

(e) a detector receiving light from the analyzer;

(f) a first optical structure introducing the beam, after it passes through the polarizer, into the anterior chamber generally parallel to an iris of the eye so that the beam

is refracted within the anterior chamber and impinges onto the iris, is reflected from the iris, and then exits the anterior chamber approximately collinear with the introduced beam;

(g) a second optical structure receiving the beam after it exits the anterior chamber and guiding it to the detector; and

(h) a polarization modulator control device coupled to a control terminal of the polarization modulator and operative to shift a DC bias signal applied to the polarization modulator to extinguish light of the beam to prevent it from passing from the analyzer to the detector.

19. The system of claim 18 wherein the polarization modulator control device is operative to simultaneously apply a DC signal and an AC signal to the polarization modulator to extinguish any light passing through the analyzer to the detector by shifting the DC signal to a value that extinguishes any AC component of an output signal produced by the detector, the value of the shifted DC signal then representing the concentration of the optically active ingredient in the anterior chamber.

20. The system of claim 18 wherein the optically active substance includes glucose.

21. The system of claim 19 wherein the polarization modulator includes a Faraday rotator and the DC signal with the AC signal superimposed thereon is applied to a coil of the Faraday rotator.

22. The system of claim 21 wherein the DC signal is a DC current having a value in the range of about 0.01 to 100 milliamperes.

23. The system of claim 22 wherein the AC signal is an AC current having a value in the range of about 0.01 to 10 amperes.

24. The system of claim 18 wherein the light source in monochromatic, and further including a collimating lens collimating the beam.

25. The system of claim 19 wherein the polarization modulator includes a Kerr cell.

26. The system of claim 19 wherein the polarization modulator includes a Pockels cell.

27. A method of measuring glucose concentration in a sample, comprising the steps of:

(a) passing a beam of collimated light through a polarizer oriented in a first direction to polarize the light in the first direction, a polarization modulator, an analyzer oriented in a second direction to polarize the light in a second direction, and a focusing lens, and then to a detector;

(b) adjusting at least one of the polarizer and the analyzer to extinguish any light passing from the analyzer to the detector;

(c) locating the sample between the polarizer and the analyzer; and

(d) simultaneously applying a DC signal and an AC signal to the polarization modulator to extinguish any light passing from the analyzer to the detector, by shifting the DC signal to a value that produces a null in the AC component of an output signal produced by the detector, the value of the shifted DC signal then representing the glucose concentration in the sample.

28. The method of claim 27 wherein step (a) also includes passing the beam through a quarter wave plate after the polarizer.

29. The method of claim 28 wherein step (d) includes applying the DC signal with the AC signal superimposed thereon to a coil of a Faraday rotator.

30. The method of claim 29 wherein the DC signal is a DC current having a value in the range of about 0.01 to 200 milliamperes.

31. The method of claim 30 wherein the AC signal is an AC current having a value in the range of about 0.01 to 10 amperes, to thereby reduce noise to the range of a few millivolts or less.

32. The method of claim 31 including applying the output signal produced by the detector to an input of a lock-in amplifier, and shifting the DC signal to a value that causes an output of the lock-in amplifier to have no DC component.

33. The method of claim 28 including passing the beam through the aqueous humor of a human eye so that a portion of the beam passing through the aqueous humor is approximately parallel to an iris of the eye.

34. The method of claim 28 including passing the beam through the aqueous humor of a human eye, by providing an input portion of the beam parallel to a tangent to the center of the cornea of the eye, causing the portion of the beam passing through the aqueous humor to be reflected from a point of the iris of the eye, the reflected portion of the beam emerging from the aqueous humor as an output beam which is substantially parallel to the input portion of the beam.

35. The method of claim 34 wherein the output beam is substantially co-linear with the input portion of the beam.

36. A system for measuring glucose concentration in blood in a sample, comprising in combination:

(a) a collimated light source producing a beam;

(b) a polarizer oriented in a first direction to polarize light of the beam in the first direction;

(c) a polarization modulator transmitting light from a quarter wave plate;

(d) an analyzer polarizing light from the polarization modulator in a second direction;

(e) a detector receiving light from the analyzer;

(f) the sample being located between the polarization modulator and the analyzer; and

(g) modulator control circuitry coupled to at least one control terminal of the polarization modulator and operative to simultaneously apply a DC signal and an AC signal to the polarization modulator to extinguish any light passing through the analyzer to the detector by shifting the DC signal to a value that extinguishes any AC component of an output signal produced by the detector, the value of the shifted DC signal then representing the glucose concentration in the blood of the sample.

37. The system of claim 36 including a quarter wave plate oriented in the first direction and transmitting the light polarized by the polarizer.

38. The system of claim 37 wherein the modulator includes a Faraday rotator and the DC signal with an AC signal superimposed thereon is applied between the terminals of a coil of the Faraday rotator.

39. The system of claim 38 wherein the DC signal is a DC current having a value in the range of about 0.01 to 100 milliamperes.

40. The system of claim 39 wherein the AC signal is an AC current having a value in the range of about 0.01 to 10 amperes.

41. The system of claim 40 including a lock-in amplifier receiving a reference voltage and the output signal produced by the detector and operative to invert components of that signal lower than the reference voltage, filter a resulting signal including the non-inverted and inverted components of the output signal produced by the detector and filtering that signal.

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